Tests for some Statistical Hypotheses for Dependent Competing Risks

Isha Dewan, Indian Statistical Institute, New Delhi, India

and

J.V. Deshpande, Pune University, India and Ohio State University, U.S.A.

The competing risks situation arises in life studies when a unit is subject to many,say k , modes of failure and the actual failure , when it occurs , can be ascribed to a unique mode. A commonly used description of the competing risks situation is the latent failure time model. However, neither the joint distribution of the latent failure nor their marginals are identifiable from the joint probability distribution of the failure time and the cause of failure if the latent failures are not independent. Hence , the independence or otherwise of the latent lifetimes cannot be statistically tested from any data collected on the failure times and their corresponding causes.

We assume that the competing risks are dependent and review tests for equality of cause-specific hazard functions as well as tests for testing for equality of the sub-distribution functions and the sub-survival functions. In most cases the statistics involved are linear combinations of the sign statistic and the Wilcoxon-signed rank type statistic. We also look at tests based on Kolmogrov-Smirnov type statistics - these tests can be modified to include censored data.

We discuss the problem of testing bivariate symmetry of the joint distribution of the dependent latent lifetimes based on the competing risks data. Lastly we consider tests for independence of the time to failure and the cause of failure. In this context we present some new results when there are more than two risks.